Wisconsin Highway Research Program
Request for Proposal for

Evaluation of Thin Polymer Deck Overlays and Deck Sealers

Proposals must be submitted
no later than
5 PM (CST), Wednesday, March 2nd, 2011

For further information regarding this RFP
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Wednesday, January 12th, 2011

Revised February 21, 2011: Changed dates in Section VII to reflect 36 month project duration.

Researcher Proposal Preparation Guidelines

WHRP Proposal Guidelines are available on the WHRP website (http://www.whrp.org/rfps-and-guidelines.html?current=three&sub=none). Please refer to these instructions in preparation of your response.

I. Background and Problem Statement

According to the U.S. Department of Transportation, of the 600,905 bridges across the country as of December 2008, 72,868 (12.1%) were categorized as structurally deficient. Many of these bridges are deficient due to deck deterioration caused by intrusion of water and chlorides into the concrete. It is well known that water, if allowed to penetrate the surface of the deck, can collect in the pore structure of the concrete and cause cracking and de-lamination through freeze-thaw cycles as well as many other mechanisms. In addition, chloride intrusion into the deck degrades both the cement paste and accelerates corrosion of the steel reinforcing bars. Thus, it is critical for bridge owners to develop protocols to extend the service life of not only the bridge deck, but the bridge itself.

Many states, including Wisconsin, incorporate some form of deck sealing into their maintenance strategies. In addition, many states use thin polymer overlays for increasing safety (skid resistance) of their bridge decks. It is known that these products offer waterproofing capabilities, though studies on its effectiveness are extremely limited.

This study will evaluate the effectiveness of thin polymer overlays for use as an effective deck waterproofing agent on bridge decks. The study will also compare these products to approved deck sealers by WisDOT as well as new technologies (both foreign and domestic) to determine a guideline for the optimal/cost-effective bridge deck maintenance strategy to be used in Wisconsin. In addition, if polymer overlays are found to be a cost-effective solution, the study will develop specific guidelines for the optimal application strategy during the life of the bridge.

II. Objectives

The objective of this project is to explore the waterproofing capabilities, durability, and additional benefits of utilizing thin polymer overlays on bridge decks in Wisconsin. These results shall be compared with conventional deck sealers, polymer modified asphaltic concrete overlays, as well as new and emerging technologies to determine the optimal bridge deck maintenance strategy to be employed by WisDOT.

III. Scope of Work

The PI should submit, as a part of the proposal, a proposed work plan for all tasks listed below (in addition to other tasks deemed appropriate to the PI).

a) **Task 1: Literature Review**
Collect, review, and interpret relevant practice, performance data, research findings, and other information related to the use of thin polymer overlays, sealers, and other technologies (both European and domestic).

b) **Task 2: State Agency Survey**

Conduct a survey of State DOT's (minimum of 5) with similar climates, as well as WisDOT Regional Bridge engineers, to ascertain current product usage, surface preparation, relative durability, life expectancy, cost, etc. Also collect deck maintenance and preservation strategies from these States.

c) **Task 3: Materials Selection and Experimental Design**

i) Materials Selection

(1) The research team will propose at a minimum of six products for testing consisting of four new products and two conventional deck sealers currently used by WisDOT. All products require approval by the POC prior to any field or laboratory testing.

ii) Experimental Design: Field and laboratory experimental plans will include tests that are capable of evaluating the following performance properties:

(1) Freeze-Thaw resistance
(2) Durability to impact (snowplow blade)
(3) Abrasion resistance
(4) Bond to existing concrete and new concrete patches
(5) Surface Preparation
(6) Permeability
(7) Ultraviolet degradation
(8) Long-Term performance

iii) Field Testing:

(1) Scope: It is expected that field testing will occur on a minimum of two bridges. The monitoring and evaluation plan developed by the researcher must include, use of sensor to monitor moisture and chloride intrusion over time, and regular field visits to conduct abrasion and bond tests to evaluate overall durability. The research team is responsible for development of a field evaluation testing plan that will provide sufficient data to evaluate candidate systems within the fiscal constraints of the project.

(2) Location: Field sections will be limited to one county in WisDOT's SW Region.

iv) Interim Report:

Submit an interim report for POC review and approval justifying selection of materials and test methods, and detailing experimental plans for laboratory and field evaluation.

d) **Task 4: Execution of Work Plan**

Upon POC approval procure necessary materials and execute the testing program.

e) **Task 5: Analysis and Reporting**

i) Apply findings from laboratory and field data to develop a system to evaluate deck sealers currently used by WisDOT and the polymer modified deck overlay systems.

ii) Define application guidelines for WisDOT Engineers for use of selected systems for placement during new construction or for bridge deck rehabilitation.

iii) For selected systems, develop draft guidelines for bridge deck maintenance strategies to be utilized by WisDOT.

iv) Conduct a cost-benefit analysis to define best practices for WisDOT. This analysis will include products currently accepted by WisDOT and the systems selected as part of the research project. Factors to consider in the cost benefit analysis along with examples of issues that are expected to be addressed by the research include:
   (1) Laboratory and field testing results
   (2) Application Guidelines
      (a) Timing of application: 28 days after construction with subsequent replacement or placement after 10-15 years of service life.
      (b) Application criteria: Based on chloride penetration, PONTIS deck element data, or on a predetermined schedule.
   (3) Maintenance Strategies
      (a) Compare current practice of using deck sealers with concrete overlays against use of thin polymer modified overlays.

v) Reporting: Synthesize information obtained and present in the form of a draft final report. Research recommendations will present guidelines for the optimal application strategy of deck sealers and polymer overlays during the life of the bridge and identify future research needs to promote implementation of this research effort.

vi) A formal presentation of the project to the WHRP Structures Technical Oversight Committee (TOC) is expected at the conclusion of the project.

IV. WisDOT/TOC Contribution

a) Expected level of involvement by Staff/TOC Members: The POC and WisDOT Staff will support the research in the following areas:
   i) Review and comment on interim report submitted at the conclusion of Task 3.
   ii) Support from all WisDOT regions in participation in the Task 2 User Survey. The WisDOT SW region will also provide support in identifying field sections
   iii) The POC at a minimum will meet semi-annually with the research team to monitor project progress.

b) WisDOT Equipment
   i) Researchers should not assume availability of WisDOT equipment in the proposal. If equipment is donated to the project by WisDOT or another entity, a letter of commitment must be included in the proposal.

V. Other Project Requirements

a) Laboratory/Technician Certifications: None

b) Travel: The research team is responsible for the following travel:
   i) At a minimum, attendance at the TOC meeting for the final project presentation and the bi-annual POC meetings.
   ii) Travel to field sections. One county in WisDOT's SW region has been selected to minimize costs associated with travel for field monitoring.

iii) Field visits to WisDOT bridges that have these overlays currently in place as well as bridges that will be newly overlaid for the study will be necessary.

VI. Specific Results, Findings, Tools, etc. (Deliverables)

a) Guidance Documents containing necessary modifications in WisDOT specification format.
b) Presentation Requirements. All projects require the PI to give a closeout presentation after submittal of the draft final report.
c) Reporting Requirements. Electronic copy in PDF format and 15 hard copies delivered to WHRP by the contract end date. The researcher is expected to address TOC comments in the final report and deliver in WHRP format.

VII. Budget and Time Frame

a) Project Duration is recommended for 36 months (starting August 1, 2011 and ending July 30, 2014)
   i) Deadline for submittal of the draft final report is April 30, 2014.
   ii) Deadline for submittal of the final report is July 30, 2014.
b) Project Budget shall not exceed $167,000.
c) The researcher is expected to submit the draft final report with quality technical writing and proper grammar. It is acceptable to include a technical editor on the research team to ensure these requirements are met.
d) Matching funds will not be considered in the proposal evaluation process.

VIII. Implementation

The project will have immediate usefulness to WisDOT bridge maintenance engineers who will be able to use the guidelines for developing deck maintenance strategies. Specifically, draft guidance in WisDOT specification format will be delivered to facilitate implementation. It is anticipated that the following guidance documents used by the Bureau of Structures will be impacted:

a) WisDOT Standard Specifications
b) WisDOT Bridge Manual – Chapter 40: Bridge Rehabilitation
c) WisDOT Structure Inspection Manual
d) Other guidance deemed appropriate by the POC.

These draft documents are due with the draft final report and will be reviewed in detail by the POC.